

# Prerna

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## EDUCATION

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### University of Kentucky

*Doctor of Philosophy*

- Current GPA: 4.0/4.0

Lexington, KY

*Expected May 2028*

### Indian Institute of Technology

*Masters in Science*

- Msc in Mathematics
- CPI: 8.38/10.0

Bombay, India

*May 2022*

### Maharishi Dayanand University

*Bachelors in Science*

- Mathematics Honors
- Percentage: 84.44%

Haryana, India

*Aug 2020*

## RESEARCH

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### Graduate Researcher

*University of Kentucky, Advisor: Prof. Bert Guillou*

2023–Present

*Lexington, Kentucky*

- Explored foundational topics in stable homotopy theory and its connections to cohomology theories.
- Studied advanced concepts, including:
  - \* The Brown Representability Theorem and its implications in homotopy theory.
  - \* Spectra and their role in defining and representing homology and cohomology theories.
  - \* Stable splittings of spaces and their applications in algebraic topology.
  - \* The loop space of a suspension and its significance in homotopy groups.
  - \* The Dold-Thom Theorem and its relationship to infinite symmetric products.
  - \* Steenrod squares, powers, and their use in computations in cohomology theories.
- Engaged in rigorous mathematical discussions, problem-solving, and independent study to enhance expertise in algebraic topology.

### Summer Reading

*University of Kentucky*

June 2024 - August 2024

*Kentucky*

- Conducted an introductory study on vector bundles and K-theory
- Worked under the supervision of Prof. Bert Guillou, referencing Allen Hatcher's Vector Bundles' textbook for comprehensive understanding.
- Investigated the structure and classification of vector bundles, utilizing advanced mathematical frameworks to understand their classification in diverse topological spaces especially spheres.
- Explored equivariant K-theory, examining how group actions influence the K-theoretic properties of vector bundles

### Algebraic Topology Project

*Indian Institute of Technology - IIT*

Jan 2022 - April 2022

*Bombay, India*

- Conducted an extensive literature review on algebraic topology, emphasizing the fundamental group.
- Worked under the supervision of Professor Saurav Bhaumik, referencing Allen Hatcher's algebraic topology textbook for comprehensive understanding.
- Applied advanced concepts of covering spaces and deck transformations to calculate fundamental groups studied spaces.
- Explored topics including compact Riemann surfaces of genus  $g$  and real and complex projective spaces of dimension  $n$ .

### Project on Borsuk-Ulam Theorem and Its Equivalences

*Indian Institute of Technology - IIT*

May 2021 - August 2021

*Bombay, India*

- Delved deeply into the intricacies of the Borsuk-Ulam Theorem, dissecting its various statements and implications.
- Collaborated closely with Prof. Rekha Santhanam to scrutinize the interconnections between Borsuk-Ulam Theorem, Brouwer Fixed Point Theorem, and Tucker's Lemma.
- Applied acquired knowledge to prove the Ham Sandwich Theorem as a direct consequence of the Borsuk-Ulam Theorem.
- Utilized "Using Borsuk-Ulam Theorem" by Jiri Matousek as the primary reference.

## TEACHING EXPERIENCE

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### Teaching Assistant - Calculus 2

*University of Kentucky*

August 2024 – December 2024

*Lexington, KY*

### Teaching Assistant - Calculus 1

*University of Kentucky*

August 2023 – May 2024

*Lexington, KY*

- Led recitation sessions, reinforcing course materials and encouraging collaborative learning among students.
- Assisted professors in grading assignments and exams, contributing to comprehensive student assessments.
- Provided academic and personal guidance to Freshmen, aiding in their transition and fostering a supportive learning environment.

### Mentor, Summer of Science - Mathematics and Physics Club

*Indian Institute of Technology*

June 2022 – August 2022

*Bombay, India*

- Guided students from diverse engineering fields in in-depth exploration of Number Theory and Group Theory.
- Conducted weekly mentoring sessions to provide clarification on theoretical concepts, address doubts, and facilitate discussions on project materials.
- Reviewed and provided constructive feedback on project reports, ensuring a high standard of academic achievement and fostering a collaborative learning environment.

## CONFERENCE ATTENDED

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### Midwest Topology Seminar

*Mathematics Department*

Nov. 2-3, 2024

*University of Chicago*

### Graduate Student Topology and Geometry Conference

*Mathematics Department*

April 12-14, 2024

*Michigan State University, Michigan.*

### Midwest Topology Seminar

*Mathematics Department*

March 16-17, 2024

*Loyola University Chicago*

## POSITION OF RESPONSIBILITY

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### President

*Indian Wildcats Association*

Aug 2024 - Present

*University of Kentucky, Lexington*

### Department Coordinator

*Mathematics Department*

Aug 2021 - May 2022

*IIT, Bombay*

### Core Team Member in Organizing Committee of Mathematics Olympiad

*Mathematics Department*

Dec 2021 - Feb 2022

*IIT, Bombay*

### Class Representative (First Year Msc. Mathematics)

*Mathematics Department*

Aug 2020 - May 2021

*IIT, Bombay*

## HONORS & AWARDS

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AIR-46 in IIT-Joint Admission Test

2020

2nd Rank in Inter College Math's Quiz Competition in MD University, Haryana

2019

Awarded scholarship by Govt. of Haryana for securing grade A in Class 12

2018

Secured 1st rank in School in IMO and 2nd rank in school and 304th international rank in 17th SOF

2014